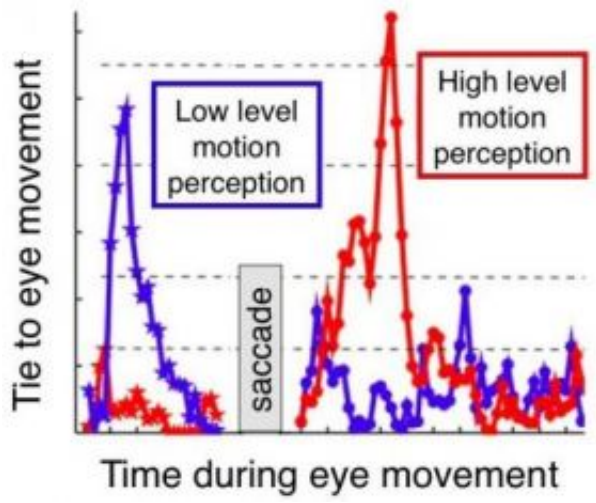
# Understanding Smooth Eye Pursuit

July 2 2007




During smooth pursuit eye movement, both low and high level motion perception have their influence. Credit: Jeremy Wilmer

Researchers at the University of Pennsylvania have shed new light on how the brain and eye team up to spot an object in motion and follow it, a classic question of human motor control. The study shows that two distinctly different ways of seeing motion are used — one to catch up to a moving object with our eyes, a second to lock on and examine it.

“Without the ability to lock our eyes onto a moving target, something called smooth pursuit, athletes cannot ‘keep their eye on the ball,’ and a person walking down the street cannot examine the facial expression or identity of a passerby,” said Jeremy Wilmer, postdoctoral fellow in the Department of Psychology in Penn’s School of Arts and Sciences and

lead author of the study.

Researchers found that volunteers showed a range of capabilities when it came to sensing and following motion, and the careful measurement of such differences produced novel insights into the workings of the smooth pursuit system.

“Our automatic tendency is to assume you and I see the same baseball, or color, or face, but in fact our experiences can be quite different,“ Wilmer said. “The assumption of a common visual experience can backfire when we assume wrongly that the person next to us perceives the same flying projectile, or red hexagonal sign, or emotion that we do.”

Researchers explored the two ways of perceiving motion to see how each contributes to smooth pursuit. The first, called low-level motion perception, is the sense one gets of disembodied motion before knowing what is moving. The second, called high-level motion perception, is the ability to watch an object move through time and space after it has been recognized.

Participants who were good at low-level motion perception caught up to a moving object with their eyes more easily. A completely different set of volunteers exhibited skill at high-level motion perception and were much better at locking onto a moving target once their eyes caught up to it. This result shows that distinct experiences of motion drive different stages of smooth pursuit.

“Our experience of the world normally appears quite seamless,” Wilmer said, “but in fact our brain sees many aspects separately and knits them together into one experience of the world.“

The study result builds on research into how piecemeal processing in the brain leads to holistic experience and seamless behavior. It also provides

insight into a smooth pursuit system important for both social skills and sports. The first in-depth study of how individuals differ from each other in their ability to sense and follow motion, this research sets the stage for future studies of genetic and environmental influences that shape conscious visual experience.

Smooth pursuit ability is rare in the animal kingdom and only well developed in primates such as humans, and in praying mantises.

“It could be,” Wilmer said, “that a penchant for high-level motion perception is essential for our incredibly handy ability to lock onto and examine moving objects.”

Wilmer and Ken Nakayama, professor of psychology at Harvard University, reported their findings in the current issue of *Neuron*.

Source: University of Pennsylvania